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Title

A method of navigating in a virtual three-dimensional environment and an electronic device employing such method.

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Technical field

10 The invention relates to a method of navigating in a virtual three-dimensional environment in an electronic device, wherein a movable physical member is controlled by applying a finger of a user to the movable physical member, and to an electronic device comprising a movable physical member for navigating in a virtual three-dimensional environment, said movable physical member being arranged for being controlled by a finger of a user applied to a
15 user surface of the movable physical member.

Related prior art

20 The term "virtual three-dimensional environment" when used in this specification is to be understood as e.g. a hierarchically structured menu system as it is commonly known in electronic devices, such as computers, mobile telephones, PDAs (Personal Digital Assistant), etc.

25 There exist different methods of navigating in such virtual three-dimensional environments in an electronic device, including the use of depressable keys, a joystick or a soft-key provided on a display. In e.g. a mobile telephone the navigation is conventionally performed by use of "Yes" and "No" keys and a kind of scroll key that may comprise two keys (up/down or left/right). In this
30 embodiment at least three and possibly four keys are necessary to navigate sideways and up and down in the hierarchy of the virtual three-dimensional environment. This means that the finger used for navigating must be moved between these different keys. Additionally, it is known to employ a movable physical member, such as a joystick, for navigating in a virtual three-
35 dimensional environment. The joystick may be movable in four different directions in the same plane and may also be depressed. By moving the

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- joystick in any one of the four directions in the same plane it is possible to navigate through a menu system of the virtual three-dimensional environment and by depressing the joystick the actual command is entered into the electronic device. WO 01/28199 discloses an electronic device
- 5 provided with such a joystick which may be moved in four different directions and may be depressed. The electronic device is provided with means whereby a first function is achieved if the joystick is depressed for a long time and another function if the joystick is depressed for a short time only.
- 10 A similar depressing-time dependent function is disclosed in US-A-5 923 327 in which the key to be depressed is incorporated in a display screen and the user touches the display screen for navigating in the virtual three-dimensional environment.
- 15 When navigating in a virtual three-dimensional environment it is desirable to be able to navigate in six mutually right-angled directions. As described above this may be achieved by providing a plurality of hard keys and/or soft keys that each represents movement in one or two directions when depressed, or by providing a joystick that allows movement in a plurality of
- 20 directions. However, a disadvantage by the known electronic device provided with means for navigating in a virtual three-dimensional environment is that for moving upwards in the hierarchy of commands a special key or a joystick must be depressed, possibly for a preset period of time.
- 25 Depressing a key or a joystick for moving upwards in a virtual three-dimensional environment seems, however, to be illogical since the movement of the finger of the user is in the exact opposite direction, i.e. a downwardly depression. This problem has been solved by a joystick disclosed in JP-8050532 which is movable in six different directions. With
- 30 this joystick it is possible to navigate upwards simply by pulling the joystick upwards.
- 35 However, this solutions is impractical if the electronic device and thereby the movable physical member for navigation is small as it is the case when the electronic device is e.g. a mobile telephone.

Object of the invention

5 It is therefore an object of the invention to provide a method and an electronic device for navigating in a virtual three-dimensional environment by applying a finger to a movable physical member, in which method and electronic device the above-mentioned disadvantages have been overcome.

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Summary of the invention

The object of the invention is achieved by providing the method mentioned in the opening paragraph such that navigation in one direction is achieved by
15 removing the finger from the movable physical member and re-applying it to the movable physical member within a set time limit.

Thereby a new and simple method of navigating in one direction is obtained, which method does not require movement of the movable physical member as such or movement of the finger to another key to be depressed, but only
20 requires a special movement of a finger applied to the movable physical member.

The time limit to re-apply the finger to the movable physical member may be set at any desired size. Preferably, however, it is below a few seconds which
25 should be suitable for most appliances and most users should be able to remove and re-apply the finger within such time limit.

The navigation achieved by the method according to the invention is preferably a step upwards in a hierarchy of commands in the virtual three-dimensional environment. An upwards navigation in the hierarchy of the virtual three-dimensional environment is in conformity with the movement of the finger which is lifted or moved upwards before it is re-applied to the movable physical member.

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The object of the invention is also achieved by providing the electronic device mentioned in the openings paragraph with a movable physical member that is provided with sensing means for sensing if a finger is applied to the user surface of the movable physical member, which sensing means is electrically connected to a timer arranged to start counting when the finger is removed from the user surface of the movable physical member and to stop when the finger is re-applied to the user surface of the movable physical member, said electronic device being arranged to perform a navigation in one direction in the virtual three-dimensional environment if the timer counting is below a set limit. By providing the movable physical member with such sensing means it is suitable for carrying out a new method of navigating in a virtual three-dimensional environment.

In a first embodiment of the invention the sensing means comprises an IR (infra red) diode and an IR detector arranged in such manner that the IR light is reflected from the IR diode to the IR detector by the finger when the finger is applied to or is in the proximity of the user surface of the movable physical member. When it is desired to perform the navigation by the method according to the invention the finger must be removed and re-applied to the user surface of the movable physical member within a short period of time. The finger must be removed to a distance where the IR light is no longer reflected by the finger.

The IR diode and the IR detector is preferably positioned at a base of the movable physical member, and two light guides extend from the base of the movable physical member to the user surface of the movable physical member. Thereby the movable physical member can be made smaller than if the IR diode and the IR detector were to be incorporated in the movable physical member.

In a second embodiment of the invention the sensing means comprises a micro switch provided at the user surface of the movable physical member, which micro switch is depressed when a finger is applied to the user surface of the movable physical member. By using a micro switch in connection with the user surface of the movable physical member it is easily registered whether a finger is applied to the user surface or not.

In a third embodiment the sensing means comprises two conductive areas at the user surface of the movable physical member, which two conductive areas are arranged to be electrically short-circuited when a finger is applied to the user surface. In this way it is also easily registered whether a finger is applied to the user surface or not.

The virtual three-dimensional environment preferably comprises a hierarchically organised menu system, and the navigation direction achieved is a step upwards in a hierarchy of commands in the virtual three-dimensional environment. By providing the achieved navigation to be a step upwards in the virtual three-dimensional environment it is brought into conformity with the movement of the finger which will typically also be upwards when it is removed from the user surface of the movable physical member.

The electronic device is preferably provided with a display adapted to graphically display at least a part of the menu system so that the user is assisted in his navigation through the virtual three-dimensional environment.

In a preferred embodiment for the electronic device the movable physical member is a joystick that is movable in different directions.

The invention is especially suitable for small electronic devices like a mobile communications device, such as a mobile telephone.

It shall be emphasised that the term "comprise/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps components or groups thereof.

Description of the drawings

The invention will be described in detail in the following with reference to the drawings in which

Claims

1. A method of navigating in a virtual three-dimensional environment in an electronic device (1), wherein a movable physical member (7;7';7'') is controlled by applying a finger (9) of a user to the movable physical member (7;7';7''), **characterised in** that navigation in one direction is achieved by removing the finger (9) from the movable physical member (7;7';7'') and re-applying it to the movable physical member (7;7';7'') within a set time limit.
2. A method according to claim 1, **characterised in** that the set time limit is below a few seconds.
3. A method according to claim 1 or 2, **characterised in** that the navigation direction achieved is a step upwards in a hierarchy of commands in the virtual three-dimensional environment.
4. An electronic device comprising a movable physical member (7;7';7'') for navigating in a virtual three-dimensional environment, said movable physical member (7;7';7'') being arranged for being controlled by a finger (9) of a user applied to a user surface (8;8';8'') of the movable physical member (7;7';7''), **characterised in** that the movable physical member (7;7';7'') is provided with sensing means for sensing if a finger (9) is applied to the user surface (8;8';8'') of the movable physical member (7;7';7''), said sensing means being electrically connected to a timer (15) arranged to start counting when the finger (9) is removed from the user surface (8;8';8'') of the movable physical member (7;7';7'') and to stop when the finger (9) is re-applied to the user surface (8;8';8'') of the movable physical member (7;7';7''), said electronic device being arranged to perform a navigation in one direction in the virtual three-dimensional environment if the timer counting is below a set limit.
5. An electronic device according to claim 4, **characterised in** that the sensing means comprises an IR (infra red) diode (10) and an IR detector (11) arranged in such manner that IR light is reflected from the IR diode (10) to the IR detector (11) by the finger (9) when the finger (9) applied to or is in the proximity of the user surface (8) of the movable physical member (7).

6. An electronic device according to claim 5, **characterised in** that the IR diode (10) and the IR detector are positioned at a base of the movable physical member (7), and that two light guides extend from the base of the movable physical member to the user surface (8) of the movable physical member (7).
7. An electronic device according to claim 4, **characterised in** that the sensing means comprises a micro switch (17) provided at the user surface (8') of the movable physical member (7'), said micro switch (17) being depressed when a finger is applied to the user surface (8') of the movable physical member (7').
8. An electronic device according to claim 4, **characterised in** that the sensing means comprises two conductive areas (18,19) at the user surface (8'') of the movable physical member (7''), said two conductive areas (18,19) being arranged to be electrically short-circuited when a finger (9) is applied to the user surface (8'').
9. An electronic device according to any one of claims 4-8, **characterised in** that the virtual three-dimensional environment comprises a hierarchically organised menu system, and that the navigation direction achieved is a step upwards in a hierarchy of commands in the virtual three-dimensional environment.
10. An electronic device according to claim 9, **characterised in** that the electronic device (1) is provided with a display (4) adapted to graphically display at least a part of the menu system.
11. An electronic device according to any one of claims 4-10, **characterised in** that the movable physical member (7;7';7'') is a joystick.
12. An electronic device according to any one of claims 4-11, **characterised in** that the electronic device (1) is a mobile communications device, such as a mobile telephone.